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Behavior Analysis and Addictive Behavior: A Chance for Change

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BEHAVIOR ANALYSIS

AND ADDICTIVE BEHAVIOR:

A CHANCE FOR CHANGE

by

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TITLE: BEHAVIOR ANALYSIS AND ADDICTIVE BEHAVIOR: A CHANCE FOR CHANGE

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Drug dependence is a far-reaching problem that goes beyond the individual to society at large. While a myriad of substances have addictive properties, the scope of this review is limited to crack cocaine – how the brain, specifically the mesolimbic dopamine system, is compromised by administration of crack cocaine, physiological changes and the relevance of dopamine levels to susceptibility to addiction.

Studies based on the use of behavior analysis tools including functional analysis, positive and negative reinforcement, delayed discounting, contingency management, stages of readiness, motivation for change, and determining alternate behaviors as replacements for addictive behavior are included. Participants in the primary studies were cocaine abusers who were attending community treatment centers. Inclusion criteria varied by study but most required a clean or negative urine result prior to the start of the study as well as an assessment to determine extent of drug use and other baseline measurements. The use of behavior analysis in providing treatment options is a viable alternative for crack addicted individuals as shown by studies presented in this review. Offering addiction professionals effective treatment programs such as contingency management using voucher programs is viable but only if

communities are willing to provide the resources necessary to make these alternative treatments available to paying and nonpaying clients.

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CHAPTER 1

INTRODUCTION

What is an addiction? What is the difference between substance abuse and substance addiction? Why is an addiction so difficult to stop? What factors, if any, come into play with addiction? Is addiction a disease or a learned behavior? There are so many questions surrounding addiction, many of which are left unanswered or answered without adequate scientific evidence, to the detriment of the individuals struggling with a life-altering addiction.

To cover the myriad of substances abused by individuals would be beyond the scope of this paper. Instead the focus is to address addiction to one illicit substance, specifically crack cocaine. While similarities exist between various substances, whether licit or illicit, and individuals may have more than one addiction, for example to nicotine and alcohol in addition to crack cocaine, crack cocaine is of particular interest due to its highly addictive properties.

Addiction Defined

Addiction or dependence on a drug is a chronic disorder characterized by compulsive behavior to find and take the drug, loss of control to limit intake of the drug, and emergence of a “negative emotional state” such as anxiety or depression when the drug is unavailable (Koob, 2006, p. 25). Progression from abuse to dependence does not always occur. Individuals may never progress beyond risky consumption while others may go back and forth between abstinence, excessive use and dependence. (Substance Abuse and Mental Health Services Administration, 1999).

Miller and Carroll (2006) identified variables that contribute to drug abuse. These include “elevated rates of family discord, violence, health problems, unemployment, poverty and financial problems, homelessness, crime, injury, child behavior problems, child abuse and neglect, disability and a host of psychological and mood problems” (Miller & Carroll, 2006, pp. 208-209). The authors also recognized the pattern that leads to drug dependence. “No one sets out to become addicted to drugs. It happens gradually, beginning with initial experimentation, moving on to more frequent use, and so on (Miller & Carroll, 2006, p. 296). “There is no clear moment when a person ‘becomes’ dependent or addicted. Instead, dependence emerges over time as the person’s life becomes increasingly centered on drug use. The diagnostic criteria for classifying people with ‘drug abuse’ and ‘drug dependence’ represent arbitrary cut points along a gradual continuum (Miller & Carroll, 2006, p. 296).

There are a host of variables that lend themselves to a propensity for addiction. Heredity, environment, including family and peers, cultural norms, gender, and age are part of the mix that may play a part in an individual’s ability to avoid becoming dependent on drugs or they may stack the deck against the individual, making them more susceptible to the addictive properties of drugs. These variables may be referenced in this discussion but are for the most part beyond the scope of this review.

Properties of Crack Cocaine

One of the most potent stimulants, cocaine originates from coca leaves which are grown primarily in the South American countries of Peru, Ecuador and Columbia. The coca leaves have been smoked by the indigenous

people of these countries to alleviate the adversities of living at high altitudes and to reduce fatigue (Kinsey et al., 2009).

As early as the 1880s, cocaine was used for medicinal purposes when it was used as an anesthetic for eye, throat and nose surgeries to eliminate pain and to constrict blood vessels to control bleeding. The powdered, hydrochloride salt form of the drug can be snorted or dissolved in water and injected. When snorted, cocaine powder is inhaled through the nose where it is absorbed into the bloodstream through the nasal tissues. When injected, a needle is used to release the drug directly into the bloodstream. Smoking involves inhaling cocaine vapor or smoke into the lungs where absorption into the bloodstream is as rapid as by injection. (Office of National Drug Control Policy, 2008).

Approximately 100 years after powder cocaine was first used, a derivative became the drug of choice for many individuals in the 1980s and 1990s because it was easy to obtain and relatively inexpensive to buy. The derivative was crack cocaine, an addictive stimulant more powerful than cocaine in powdered form. “Crack is cocaine that has been processed from cocaine hydrochloride to a free base for smoking. It is processed with ammonia or sodium bicarbonate (baking soda) and water. It is then heated to remove the hydrochloride, producing a form of cocaine that can be smoked. This form of cocaine comes in a rock crystal that can be heated and its vapors smoked. The term ‘crack’ comes from the crackling sound made when it is heated” (Office of National Drug Control Policy, 2008).

The intensity and duration of crack cocaine’s effects, including increased energy, reduced fatigue, and mental alertness is heightened the faster the drug is

absorbed into the bloodstream and delivered to the brain. Inhaling crack cocaine vapors produces a quicker, stronger high than snorting or smoking. For the crack user, that's good news and bad news: a stronger high results but the faster absorption means a shorter high – the high from snorting cocaine may last 15 to 30 minutes but the high from smoking crack may last only five to 10 minutes. In order to sustain the high, a crack cocaine user has to smoke the drug again, which often results in binges or taking the drug repeatedly within a relatively short period of time, at increasingly higher doses (National Institute on Drug Abuse, 2010).

By The Numbers

According to the 2008 National Survey on Drug Use and Health (NSDUH), approximately 8.4 million Americans aged 12 or older (representing 3.4% of this population) reported trying crack cocaine at least once during their lifetimes. Additional 2008 NSDUH data indicated that approximately 1.1 million Americans aged 12 or older (0.4% of this population) reported past year crack cocaine use and 359,000 of Americans aged 12 or older (0.1% of this population) reported crack cocaine use within the past month of when the survey was conducted (Office of National Drug Control Policy, 2008).

The NSDUH estimated that in 2007 there were 2.1 million current (past-month) cocaine users. Adults aged 18 to 25 years have a higher rate of current cocaine use than any other age group, with 1.7% of young adults reporting past-month cocaine use. Overall, men report higher rates of current cocaine use than women. Ethnic and racial differences also occur with the highest rates in those

reporting two or more races (1.1%), followed by Hispanics (1.0 %), Whites (0.9 %), and African-Americans (0.8 %) (National Institute on Drug Abuse, 2010).

The 2008 Monitoring the Future survey, which annually surveys teen attitudes and drug use, reports that while there has been a significant decline in the 30-day prevalence of powder cocaine use among 8th-, 10th-, and 12th-graders from its peak use in the late 1990s, there was no significant change in current cocaine use from 2001 to 2008; however, crack use declined significantly during this timeframe among 8th- and 12th-graders (National Institute on Drug Abuse, 2010).

In 2007, according to the NSDUH, nearly 1.6 million Americans met Diagnostic and Statistical Manual of Mental Disorders criteria for dependence or abuse of cocaine (in any form) in the past 12 months. Data from the 2005 Drug Abuse Warning Network (DAWN) report showed that cocaine was involved in 448,481 of the total 1,449,154 visits to emergency departments for drug misuse or abuse. Therefore, almost one in three drug misuse or abuse emergency department visits (31%) involved cocaine (Office of National Drug Control Policy, 2008).

According to the Office of National Drug Control Policy (2010), during 2004 cocaine was the primary drug involved in federal drug arrests. “There were 12,166 federal drug arrests for cocaine in 2004. The Drug Enforcement Agency made 7,082 arrests for powder cocaine and 3,921 arrests for crack cocaine during 2004. During FY 2008, there were 6,168 federal defendants sentenced for crack cocaine-related charges in U.S. courts. Approximately 95.9% of these

cases involved crack cocaine trafficking. Approximately 0.5% of the crack cocaine cases involved simple possession (Office of National Drug Control Policy, 2008).

An article in the March 3, 2008, issue of *Newsweek* discussed the impact of governmental programs such as the War on Drugs initiated by President Richard Nixon in 1971 and the creation of the Drug Enforcement Administration in 1973 on the criminalization of drug use. “Between 2000 and 2006, the number of drug offenders in federal prison jumped 26%, to 93,751. An additional 250,000 are incarcerated in state facilities and thousands more sit in local jail cells. This year the government has budgeted close to $13 billion for drug control, treatment and prevention” (Kalb, *Newsweek*, 2008, p. 41). That $13 billion budget was broken down with $8.3 billion going toward stopping drug flow into the United States and enforcement of drug laws and $4.6 billion devoted to treatment and prevention programs (Kalb, 2008).

Physical Ramifications

Crack cocaine is typically smoked through a simple glass pipe. The drug reaches the brain within seconds, with the amount of crack controlled by the depth of the smoke inhalation and frequency of the puffing. The effect of the drug is an extremely euphoric feeling – an intense pleasurable sensation from the high or rush. The state of euphoria intensifies normal pleasures, “a release of social inhibitions, talkativeness, and an unrealistic feeling of cleverness, great competence, and power” (Goldstein, 1994, p. 182). With sexual feelings heightened, crack users may engage in risky behavior such as unprotected sex

or sex in exchange for the drug, resulting in increased exposure to sexually transmitted diseases, including AIDS (Goldstein, 1994).

With crack cocaine, a rapid tolerance develops even before drug concentration in the blood dissipates. Binge use may result as the user tries to keep the high going. Binges may lead to psychotic behavior, including extreme paranoia, visual and auditory hallucinations and sensory sensations such as bugs crawling under the skin. A binge typically lasts 24-hours or longer, followed by a state of depression when the drug supply is depleted. Without the drug, cravings for the drug become so intense that seeking the drug becomes all important, to the detriment of everything else – family, job, food, hygiene, sleep and rational behavior (Goldstein, 1994).

CHAPTER 2

THE BRAIN'S ROLE IN ADDICTION

Humans are hard wired to seek natural reinforcement from food, water, sex, and social interaction for survival and propagation of the species. The changes that take place within the brain, specifically the mesocorticolimbic dopamine system, are the focus of ongoing research into the critical role this system plays in supplying positive reinforcement from drugs. By understanding how the brain functions when crack cocaine is used/abused provides an integral piece of the addiction puzzle.

Anatomy of the Addicted Brain

The mesolimbic dopamine system in the brain is comprised of the ventral tegmental area, the basal forebrain, which consists of the nucleus accumbens, olfactory tuberal, amygdala, and frontal and limbic cortices, and the dopaminergic connection between the ventral tegmental area and the basal forebrain (Koob, 2006). This system, also called the reward system, "mediates biologic appetites such as hunger, thirst and sexual drive" (Floyd & Seale, 2002, p.31). These appetites are "located at a rudimentary level in the brain. They are operating in neuronal systems well below the cerebral cortex and conscious thought" (Floyd & Seale, 2002, p. 31). Neurons of this system "with cell bodies in the ventral tegmental area and synapses in the nucleus accumbens, are primarily dopaminergic" (Floyd & Seale, 2002, p.31).

The process of communication between brain cells is explained by Shuman, National Institute on Drug Abuse (NIDA Notes, 2007):

“The task in neurotransmission is to convey a signal from a sending cell to a receiving cell across an open space known as a synapse. All brain cells accomplish this in approximately the same way.

The sending cell manufactures neurotransmitter molecules and stores them in packets called vesicles. When stimulated appropriately, the cell generates an electric signal and causes some vesicles to migrate to the cell membrane, merge with it, open up, and release their contents into the synapse. Some molecules drift across the synapse and link up, lock-and-key fashion, with molecules called receptors on the surface of the receiving cell. Receptors bridge the receiving cell’s membrane; they have one facet on the outside and one on the inside of the cell. When the neurotransmitter links up with the exterior facet, the interior facet precipitates an electrical response in the cell membrane or inside the cell. The result may be increased production of some cell product or—often—a repeat of the process just described, so that the message gets relayed in turn to the next cell in the circuit.

At this point, cell-to-cell communication is complete. The neurotransmitter molecules drop off the receptors. Loose again in the synapse, they meet three fates:

- Some attach to another receptor;

- Some encounter an enzyme, a chemical that breaks them apart; and
- Some reenter the sending cell via a special pathway through the axon membrane, called a transporter.

Once back inside the cell, they are available for re-release in future neurotransmission episodes.

Normally, when drugs are not present, the cycle of release, breakup, and cell re-entry maintains the amount of neurotransmitter in the synapse, and hence neurotransmission, within certain limits. In most cases, when an abused drug enters the brain, it causes neurotransmission to increase or decrease dramatically beyond these limits" (NIDA Notes, 2007).

An important finding regarding dopamine, a neurotransmitter located in the nucleus accumbens, was established by Nader through research he and his associates conducted with rhesus monkeys at Wake Forest University. Nader found that "cocaine lowers availability of the dopamine D_2 receptors in the basal ganglia—the brain region that includes key components of the reward system. The consequences may include addiction-promoting alterations in cognitive functioning and decision making" (NIDA, 2009).

The study confirmed that animals with lower D_2 receptor availability were especially responsive to cocaine's reinforcing effects. An explanation of a D_2 receptor was provided by Childress: "Cocaine-addicted adults with long histories of addiction had low numbers of dopamine (type 'D_2') receptors in the striatum (a

critical way station in the reward circuitry), as compared with controls who had no history of any substance abuse (Childress, 2006, p. 51). This finding is important for people trying to recover from cocaine addiction because receptor availability levels in some of the monkeys used in Nader's research recovered after less than one year after being removed from cocaine administration. Nader "measured the monkeys' D_2 receptor availability before cocaine exposure by injecting each animal with a radiotracer that bound to the receptors. The radiotracer competed with dopamine for the receptor and provided a measure of D_2 function. Over the course of a three-hour brain imaging study, the scientists used positron emission tomography (PET) to visualize and quantify the bound radiotracer" (NIDA, 2009).

The monkeys were allowed to self-administer cocaine in an "experimental chamber equipped with two levers—one that delivered banana pellets during the first 20 minutes of the test and another that provided the animal with an infusion of cocaine during the next 60 minutes. Then, the researchers put the animals through this sequence a second time. To describe the neurobiological effects of chronic cocaine exposure, the investigators continued the self-administration experiments and measured D_2 receptor availability for a year" (NIDA, 2009).

The monkeys whose PET scans revealed lower D_2 receptor availability at baseline testing before their initial cocaine exposure, self-administered cocaine at higher rates. "This finding suggests that lower D_2 receptor availability increases sensitivity to cocaine reward" (NIDA, 2009). PET scans administered after five days of self-administration of cocaine showed that the monkeys' available

receptors had dropped by 15%, on average. What was significant was that three monkeys that were allowed to self-administer the drug for only one week, D_2 receptor availability returned to baseline values by the third week of abstinence (NIDA, 2009).

Of particular importance was the inability of two of the monkeys in Nader's study to recover D_2 receptor availability following year-long cocaine self-administration. While these monkeys were self-administrating cocaine, they exhibited a reduced attraction to food. While the monkeys were able to press a lever for food, they did so only half as often as the monkeys whose receptors returned to baseline after long-term cocaine self-administration. According to Nader, "Although the findings are preliminary, we believe that these individuals may find rewards other than cocaine devalued. If it is not cocaine, it is just not rewarding to them" (NIDA, 2009).

Childress (2006) agreed that low D_2 dopamine receptors influence vulnerability to addiction. Brain-imaging showed that cocaine-addicted adults, who reported long-term cocaine abuse, actually had low numbers of type D_2 receptors. Childress noted that the finding goes against what was expected – that addicted individuals would have more dopamine receptors and would experience a greater (positive) drug effect and might become more easily addicted. Other research cited by Childress found that people in the control group (no addictions), who responded positively to an "infusion of the stimulant methlphenidate" (Childress, 2006, p. 51), had D_2 receptors that were at levels as low as cocaine addicts who had abused cocaine for many years. The same study

found that individuals with normal levels of D_2 receptors found the stimulant too powerful and unpleasant. This finding suggests that a higher D_2 receptor level may actually protect an individual from becoming drug dependent (Childress, 2006).

The firing of dopamine cells by the introduction of drug conditioned cues was studied by Goldstein, Tomasi, Alia-Klein, Carrillo, Maloney, Woicik, Want, Telang and Volkow (2009). By introducing drug-related and neutral words to cocaine-addicted individuals and controls, researchers hypothesized that the drug-related words would trigger activation in the mesencephalon, the area of the brain where dopaminergic cells are found in the cocaine addicted subjects. Using functional magnetic resonance imaging or fMRI, researchers demonstrated that drug-related words activated the mesencephalon in the cocaine addicted individuals.

Fifteen individuals with cocaine use disorders and 15 control participants, matched on sex, age, education, and general intellectual functioning, completed screening and gave written informed consent to participate. Participants were scanned during a drug word fMRI task while viewing drug or neutral words.

Using repeated measures ANOVA with verbal fluency showed group by word interaction ($p<0.01$). Post hoc t tests showed that the interaction was explained by higher drug than neutral responses in the cocaine users ($p<0.05$) but not in healthy participants, where a trend toward the reverse pattern

was shown and a significant difference was shown between the study groups for the drug words only (drug: $p<0.05$; neutral: $p>0.3$) (Goldstein et al. 2009).

For the first time, it was shown that drug words defined as “uniquely human learned verbal descriptors of stimuli” (Goldstein et al., 2009, p. 6004), increased fMRI responses in the mesencephalon, “a major source of dopaminergic release to motivationally salient or conditioned stimuli in cocaine addicted individuals” (Goldstein et al., 2009, p. 6004). According to the authors, “Our results for the first time demonstrate that, in addicted individuals, drug words alone can elicit an fMRI-BOLD (blood oxygenation level dependent) mesencephalic response, as possibly associated with dopaminergic…mechanisms…that are crucial to conditioning” (Goldstein et al., 2009, p. 6005). The authors concluded that the ease of administration of the brief verbal fluency test and fMRI cue reactivity “could be used as a biomarker of neurobiological changes in drug addiction” (Goldstein et al. 2009, p.6005).

CHAPTER 3

BEHAVIOR ANALYSIS: TOOLS FOR CHANGE

As important as brain research is to addiction, without the associated behavior – learning to use the drug, seeking the drug, buying the drug, administering the drug, avoiding discovery – the research would be moot. In other words, the brain does not operate alone. Without learning addictive behaviors, individuals would receive a high from the brain's naturally occurring release of neurotransmitters, such as dopamine, after a satisfying meal, looking at a beautiful work of art or after a sexual experience.

An individual does not inherently know how to "do drugs." He or she must learn the nuances of using drugs. White (1996) described a "culture of addiction" that meets the needs of its members that are unmet by society-at-large:

> "The culture of addiction is a way of life, a means of organizing one's daily existence, and a way of viewing people and events in the outside world. It is a way of talking, walking dressing, gesturing, believing, mating, working/playing, thinking, and seeing that separates people who are 'in the life' from those who are not. The culture of addiction encompasses values, artifacts, places, rituals, relationships, symbols, music and art, all of which reinforce one's involvement in excessive drug consumption.
>
> The culture of addiction can play a role in both initiating and sustaining substance abuse disorders" (White, 1996, p. 5).

The tools of behavior analysis provide insight into the “why” of addictive behavior, as well as approaches that give individuals living a drug dependent lifestyle the options to return to a life free of life-altering substances. A key to unlocking the “why” of addiction is functional analysis.

According to Jakes (2001), the origin of functional analysis goes back to operant conditioning, and he attributed B.F. Skinner, who used individual subjects to look at the “relationship between stimulus and response” (Jakes, 2001, p. 133) as a psychologist who believed functional analysis “explained how the occurrence of certain behaviors was a function of specific stimuli”(Jakes, 2001, p.133). Jakes explained that the “key aim of a functional analysis was to establish the situations in which symptoms or problem behaviors occur, and the apparent consequences of these behaviors” (Jakes, 2001, p. 133).

Jakes (2001) pointed to Wolpe for making functional analysis a clinical tool for psychologists and others. It was Wolpe who made the connection between a behavior and the individual’s learning history. Using anxiety as an example, Wolpe hypothesized that if you understood the learning history of a symptom, you would understand the cause of the symptom and thereby help the individual by helping he or she unlearn the association (Jakes 2001).

The National Institute on Drug Abuse website concerning drug treatment, noted that every time an individual used cocaine during treatment, the therapist and patient should do a functional analysis – “identifying the patient’s thoughts, feelings, and circumstances before and after the cocaine use.” The NIDA states that “early in treatment, the functional analysis plays a critical role in helping the

patient and therapist assess the determinants, or high-risk situations, that are likely to lead to cocaine use and provides insights into some of the reasons the individual may be using cocaine (e.g., to cope with interpersonal difficulties, to experience risk or euphoria not otherwise available in the patient's life)" (NIDA, 2010).

Medical professionals are likely to encounter patients who are exhibiting symptoms of addiction. Bloom and Smith (2001) advocated a functional assessment that included a description of the sequence of events before, during, and after the problematic behavior, exploration of reinforcements – what needs are not being met and what the patient finds pleasurable. In addition, clinicians should try to discover what attempts have been made in the past to resolve the behavior and to identify "noxious or extinguishing responses" (Bloom & Smith, 2001, p. 109).

In a medical setting outside of the office, the medical professional may offer referral to crisis counseling, addiction treatment or other services following a medical emergency such as an attempted suicide, rape, battery or other crisis. Individuals in a state of medical crisis will respond to the health professional's suggestion for follow-up care with a reliable community resource, if there is a caring, non-judgmental interaction during the course of treatment (Hoff, 2001).

One of the problems with functional assessments for crack addicted individuals is the inability for direct observation of the undesirable behavior. It would be unethical as well as illegal to advocate use of an illicit substance for the purpose of observing the events that precede use, the actual using behavior and

the resulting aftermath. Functional analysis for crack using individuals must rely on indirect functional behavior assessments.

While family members and others may contribute valuable information regarding an individual's drug use, the primary source of information is most often obtained from the individual during the admission process to inpatient and outpatient treatment programs. During the interview process for admission to a rehabilitation program, individuals may be under the influence of a substance or substances, under duress from parents, spouses or police, or may be in denial regarding the degree of their dependence on a substance or substances. At the time of the initial interaction, the individual may be facing a crisis situation including overdose or suicide ideation, loss of residence, loss of employment, loss of one or more relationships, medical emergencies or a legal crisis (Ramsay & Newman, 2000). Any or all of these factors may result in unreliable information that may be subsequently used as the basis for admission or denial for admission to a treatment program.

CHAPTER 4

UNDERSTANDING POSITIVE REINFORCEMENT/NEGATIVE REINFORCEMENT IN ADDICTION

In behavior analysis terms, positive reinforcement occurs when a behavior is “followed immediately by the presentation of a stimulus that increases the future frequency of the behavior in similar conditions,” whereas a negative reinforcement is a stimulus “whose termination or reduction in intensity functions as reinforcement” (Cooper, Heron & Howard, 2007, pp. 700-701).

With addiction, positive reinforcement may be viewed as euphoria from a normal state experienced by the user after self-administration of a drug, which is quickly followed by negative reinforcement – the need to take more of the drug to relieve the effects of withdrawal and the loss of the euphoric state. Both positive and negative reinforcement are believed to be contributing factors to the addictive properties of drugs. Wise (1988) proposed that positive and negative reinforcers could be scientifically distinguished by the various parts of the brain they activate.

A psychomotor stimulant theory of addiction, according to Wise (1988), grew out of research on biological mechanisms of drive and reinforcement. “It is an extension of the view that positive reinforcers are stimuli that elicit a variety of species-typical, biologically primitive reactions, including eating, drinking, copulation, nest building, etc.”(Wise, 1988, p.119). These types of positive reinforcers are called forward locomotion, which Wise reported was first studied by Schneirla in 1959 and correlated with brain stimulation reinforcement by

Glickman and Schiff in 1967. Wise proposed an empirical study to determine if positive and negative reinforcers could be separated by the areas in the brain they activate (Wise 1988).

The summarization of numerous research studies on brain stimulation reinforcement, amphetamine and cocaine reinforcement, opiate reinforcement, food and water reinforcement, the “motor” – “psychomotor” distinction, and brain mechanisms of negative reinforcement by Wise (1988) provide insight into complex theories regarding brain function and the relationship to addiction. Of particular interest is the section Wise (1988) devoted to the implications of these research studies, some of which follow:

- The importance of distinguishing between cravings that result from a history of positive reinforcement or from a present condition of negative reinforcing potential of the drug. Remembering past positive reinforcement is key in initial addiction and relapse after long periods of detoxification.
- Opiates and cocaine activate the same neural circuitry and either will cause a return to drug dependence in ex-addicts. Nicotine may be an underestimated stimulant to cause relapse.
- Pharmacological approaches to addiction are ineffective if only used to treat withdrawal symptoms of detoxification. Any dopamine agonist should relieve cocaine craving by targeting the same target neurons in the same positive reinforcement pathway as cocaine (Wise 1988).

The conclusion that Wise reached is concerning. Wise postulated that if the positive reinforcing properties of addictive drugs occur within the physical structure of the brain, their reinforcement may be more powerful than naturally occurring environmental stimuli such as “nature, art, or music. Whereas the signals from natural reinforcers depend on sensory transducers and the propagation of nerve impulses across axons and synaptic junctions, drugs can activate reinforcement mechanisms centrally, saturating receptor mechanisms that may never be saturated as a consequence of natural reinforcement” (Wise, 1988, p. 127).

An effect called priming is closely associated with the reinforcing properties of addictive drugs. Even after long periods of abstinence, taking even a small amount of their drug of choice, can lead to a full-blown relapse. This priming effect was the impetus for a study by De Wit and Stewart in the mid-80s, which was described by De Wit (1996). After rats were trained to deliver daily self-administered cocaine or heroin, they were put on periods of extinction. After one or two hours on extinction, rats exhibited no drug seeking behavior. A researcher then administered an injection of the self-administered drug, a different drug or saline. The rats given injections of cocaine, which was the self-administered drug, returned to drug seeking behavior for cocaine as was the case with rats that self-administered heroin and were given heroin after extinction. Heroin given to the cocaine addicted rats did not serve as a priming effect nor did cocaine given to the heroin addicted rats, which demonstrated drug specificity (de Wit 1996).

Conversely, human subjects are many times long-time drug abusers whose prior drug using history may affect responses through physiological consequences of a drug and/or conditioned or learned effects. In addition, the dependent measures with human subjects are frequently self-reports of drug craving and use whereas the dependent variables with laboratory animals are observed drug seeking and using behaviors (de Wit 1996).

De Wit (1996) cited numerous research hypotheses for the priming effect including classical conditioning, incentive motivation and operant conditioning, all of which needed more empirical study. De Wit (1996) discussed an interesting theory by Marlatt that a one-time lapse of a previously abused drug leads to increased and ongoing use of the drug due to a sense of failure on the part of the addict. De Wit (1996) stated that while this theory is "plausible," it applies only to drug users who are trying to quit their drug use and not to those who are not attempting to quit such as social drinkers. Further "systematic parametric" studies that investigate "the time course, stability, dose-dependence, context-dependence and specificity" of the priming effect are necessary, according to De Wit, in order to "discover the underlying behavior mechanisms" (de Witt, 1996, p.9) of the phenomenon.

Delayed Discounting in Addiction

Drug dependence has been shown to cause a phenomenon known as delayed discounting – a "foreshortening of time perspective, so that longer term delayed rewards are discounted in value" (Miller & Carroll, 2006, p.298). Delayed discounting is defined as a "behavioral process that values delayed reinforcers less than reinforcers that are not delayed" (Bickel & Potenza, 2006, p. 11). The

extent of discounting may be measured by psychosocial procedures where an individual chooses between an immediate reinforcer or reward and a delayed reinforcer. Bickel and Potenza (2006) provide the following example of delayed discounting: “What could provide more specific knowledge regarding the extent of discounting is identifying the amount of immediately available money that the chooser values approximately the same as delayed money. This information can be obtained by progressively decreasing the amount of the immediately available money across trials (e.g., $975, $950, $925) and keeping the delayed amount unchanged ($1,000), and then identifying the specific monetary amount that results in the chooser’s switch from the immediate to the delayed amount” (Bickel & Potenza, 2006, p. 11). The authors added, “A substantial body of literature suggests that drug-dependent individuals (alcohol-, cocaine-, heroin-, tobacco-dependent) discount money substantially more than matched control normals and that the drug dependent substantially discount their drug of dependence more than an equivalent amount of money” (Bickel & Potenza, 2006, p.12).

Contingency Management Models

As discussed previously, finding rewards to replace the powerfully addictive properties of crack cocaine and other drugs may seem impossible to achieve. One tool that is supported in the addiction literature is the use of contingencies in achieving abstinence and other target behaviors such as treatment attendance. While contingency management models are not without problems, such as a return to substance use upon termination of the use of a contingency, the use of contingencies to retain individuals in treatment and maintain abstinence results in more positive outcomes in personal areas such as

employment, interpersonal relationships and medical issues and psychological functioning show promise(Carroll & Rounsaville, 2006).

The effect of an alternative reinforcer, such as varying amounts of money on the self-administration of smoked cocaine, was a secondary purpose of a study undertaken by Hatsukami, Thompson, Pentel, Flygard, and Carroll (1994). According to the authors, the primary purpose was to address methodological issues associated with using smoked cocaine in a parametric design. Study participants, 12 male cocaine abusers, ages 24-41, completed extensive medical, legal and psychiatric histories, as well as their histories of drug use. Medical examinations, including electrocardiogram, pulmonary function test, chest x-ray, urine analysis, and blood chemistry panel were performed on all participants. Inclusionary criteria was extensive and required only cocaine and nicotine use, history of smoked cocaine use at least twice weekly for the six months preceding the study, no psychiatric disorders, no major medical problems, a negative test for HIV, no history of violence and a last chemical dependence treatment at least 12 months previously (Hatsukami et al., 1994) .

Subjects stayed for eight days (not concurrently) in an inpatient unit of a clinical research center where they were closely monitored by medical personnel during the course of the study. Following two pre-experimental days when no cocaine was administered, subjects were familiarized with equipment and procedures. On the first day of the study, subjects attended four experimental sessions. For the first three sessions, they received one of three possible doses of cocaine – 5.0 mg, 0.2 mg/kg, or 0.4mg/kg, with “the 5.0 mg considered to be a

low dose with minimal subjective and physiological effects" (Hatsukami et al., 1994, p. 117). Order of the doses was randomized and subjects received only one dose per day. During the fourth session, one of the doses was repeated and was randomly selected. (Hatsukami et al., 1994).

An IV catheter was placed in the non-dominant arm of the participant for blood monitoring and for IV access in case of emergency. For one hour, baseline measurements were recorded, followed by a sample dose of that day's dose size. Participants were given 10 tokens, each worth a specified amount of money, and told that they could use the tokens on up to 10 deliveries of a similar dose size of cocaine or turn them in for the specified amount of money ($2, $3, $5 or $7). The monetary value varied across subjects but not within subjects. After 30 minutes, a green light indicated participants could purchase another dose of cocaine with a token. Thirty minutes were taken between cocaine deliveries. Blood pressure, heart rate and ECGs were recorded at varying intervals. Subjects were required to remain seated in the room with the procedure repeated until either 10 doses were taken or five and one-half hours had elapsed. If no cocaine was administered, readings were not taken of blood pressure, etc., until the next cocaine delivery. Unused tokens were turned in for money. Tokens could not be used to buy cocaine during other sessions. Money was not given out until the end of the study. Following the delivery of cocaine, two post-experimental days followed and the same measures were taken as during the pre-experimental phase (Hatsukami et al., 1994).

The study found that higher doses of cocaine were selected over lower doses. Data analysis showed that “if the magnitude of the alternative reinforcer or the cost of cocaine was smaller, subjects were more willing to self-administer cocaine than if the magnitude of the alternative reinforcer or the cost of cocaine was higher” (Hatsukami et al., 1994, p. 123). The authors acknowledged that the small number of participants and the varying costs of cocaine and the total amount of money available may “temper” the study’s findings (Hatsukami et al., 1994).

Katz, Chutuape, Jones, and Sitzer (2002), used an abstinence-contingent voucher with heroin addicts who also abused cocaine. Fifty-two opiate-dependent subjects who recently completed an inpatient detoxification program and were enrolled in an outpatient treatment program within seven days of inpatient discharge participated in the study. Following consent, subjects provided a urine sample, completed an assessment battery and were introduced to their counselors. Subjects were grouped by urine sample results, detoxification program of referral, and living arrangements and were then randomly assigned to either treatment with or treatment without voucher incentives. Twenty-nine participants were assigned to the voucher condition; 23 subjects were assigned to the no-voucher condition. Both groups were asked to attend the clinic three times per week for three months, to submit urine samples under observation and participate in cognitive-behavioral counseling. Subjects were not mandated to attend either the research component or the counseling sessions (Katz et al., 2002). During the next three months of the study, counseling was offered once

each week and two group sessions, a Job and a Social Club, were available. The Job Club focused on employment skills such as interviewing. Clients participated until they became employed. During the Social Club, participants ate lunch and interacted with non-drug using peers so long as they were abstinent. Clients were provided with bus tokens or parking passes for each counseling session they attended. Missing seven consecutive counseling sessions resulted in dismissal from the study. Counselors were allowed to give $20 attendance vouchers to subjects who had missed up to three sessions as an incentive to return to counseling. Attendance incentives were given by mail 51 times during the study to 40 subjects – 79% were voucher clients and 74% were no-voucher clients. Letters were followed by counseling attendance on 23.5% occasions (Katz et al., 2002).

Vouchers were earned for each urine sample provided that was negative for both opiates (heroin) and cocaine. Vouchers were worth a designated monetary amount and could be exchanged for goods and services. Subjects earned $2.50 for the first opiate- and cocaine-negative urine samples, with the value increasing by $1.25 for each successive negative urine sample. For each set of three consecutive negative urine samples, clients earned a $10 bonus. Missing an appointment or submitting a positive urine sample, resulted in the voucher value being reset to $2.50. If the value was reset and the next five consecutive urine samples were negative, voucher values were reset to the earnings level reached before the reset. To encourage early engagement with the study, clients received a one-time $100 bonus for the first three consecutive

opiate- and cocaine-negative urine samples. While the three consecutive negative urine samples could be done at any time during the study, 73% of the earned bonuses were collected during the first three months. For remaining drug free throughout the study, a total of $1,087.50 could be earned (Katz et al., 2002).

Days in treatment, total number of research visits, total number of counseling sessions, number of negative urine samples, longest duration of continuous abstinence and percentage of clients with one, two and four weeks of continuous abstinence were the measures used to compare outcomes for voucher and no-voucher subjects. Clients in the voucher condition earned an average of $171 in vouchers; four clients earned no vouchers, 10 earned less than $10 in vouchers and 15 clients earned more than $10 in vouchers. Because clients were not mandated to attend research visits or counseling sessions, retention was calculated as the day of initial intake to day of the last face-to-face contact, either research or counseling visit. Mean days in treatment for voucher subjects was 35.9 out of a possible 180; 39.3 days for no-voucher subjects. Clients in the voucher group submitted, on average, 8.3 opiate- and cocaine-negative urine samples versus 6.2 opiate- and cocaine-free samples from the no-voucher group, out of a total possible of 36 samples over the course of the study. Groups differed “significantly on intake urine results at study onset: those negative at intake made more research visits (M=11.5), submitted significantly more negative urine samples (M=9.9) and had significantly longer durations of

continuous abstinence (M=19.8). There was no significant interaction between intake urine status and voucher incentive condition" (Katz et al., 2002, p. 140).

Overall results found that a voucher incentive program did not improve retention or drug abstinence outcomes for recently detoxified heroin addicts who were required to abstain from both heroin and cocaine use to earn vouchers during outpatient treatment. Two voucher incentive programs cited by the authors, specifically Downey et al. (2000) and Piotrowski et al. (1999), concluded that there was one constant in both studies, which was "some patients never contact the reinforcer because they never submit a drug-negative urine. This was true for 50% to 50% of clients in the two studies described above but was less of a factor in the present study, where 86% of clients submitted at least one negative urine sample" (Katz et al., 2002, p. 141).

The Katz study (Katz et al., 2002), which used subjects with dual-drug addictions discussed two possible improvements for future research – allowing participants who use more than one drug to stop using one drug at a time and to increase the value of the reinforcer to establish greater levels of compliance. The authors also cited possible reasons for their study results which included lapse and relapse function in heroin versus cocaine users. Recently detoxified heroin users may have a harder time in the early stages of abstinence due to the severity of withdrawal symptoms compared with participants who experience cocaine withdrawal. Another possibility was that the counseling provided in the study might have been more effective had it included "outreach efforts designed to retain clients in treatment by contacting them in the community when they fail

to show up for appointments" (Katz et al., 2002, p. 141). Providing stronger attendance incentives and allowing for a more flexible attendance schedule for an opiate addicted population may have resulted in stronger outcomes (Katz et al., 2002).

One study (Petry, Alessi, Carroll, Hanson, MacKinon, & Rounsaville, 2006) used two approaches of prize-based contingency management with 131 substance abusing outpatients at a community clinic randomly assigned to one of three 12-week treatments: standard treatment, standard treatment with contingency management for negative urine samples or standard treatment with contingency management for completing goal-related activities. A heterogeneous patient group consisting of heroin- and cocaine-abusing individuals was used to increase the generality of study findings. Following informed consent and inclusion criteria ("initiating a treatment episode at the clinic and met past-year *Diagnostic and Statistical Manual of Mental Disorders* (4^{th} ed.; American Psychiatric Association, 1994) criteria for cocaine or heroin abuse or dependence or evidenced recent use" (Petry et al., 2006, p. 593), a two-hour interview was conducted to obtain demographic data, as well as diagnostic status. The Addiction Severity Index (ASI) was administered to determine psychosocial issues and breath and urine samples were collected to determine alcohol use, which would exclude participants from the study. The ASI was repeated at one, three (post-treatment), six and nine months after initiation of treatment. Subjects received $15 for the one-month evaluation and $30 for the other evaluations.

Follow-up rates exceeded 70% in each condition at each interval (Petry et al., 2006).

Using a computerized randomization, groups were assigned to balance age, gender, ethnicity, whether or not subjects received inpatient treatment prior to seeking outpatient treatment, and whether subjects were unemployed, employed full time or employed part time. Those assigned to the standard intensive outpatient treatment condition participated in group sessions led by various clinicians that covered relapse prevention, coping and life skills, 12-step treatment and AIDS education for up to four hours each day over five days each week for four weeks with gradual reduction in sessions. Breath and urine samples were collected three days per week for the first three weeks and two days per week during weeks four through six. In addition, to control for "individualized attention associated with activity selection in one CM condition, a research assistant met with subjects for 15 minutes every week to present educational materials on health, alcohol, drugs, AIDS, stress management, depression, the law, insomnia, hepatitis, smoking, family, drinking and driving, and wellness" (Petry et al., 2006, p. 594).

With the exception of the individual education sessions, subjects assigned to the contingency group that could earn prizes by completing goal-related activities received the same treatment, including the collection of breath and urine samples, as the subjects assigned to the standard treatment only condition. Participants completed a needs assessment during the first week of the study that evaluated problems in 10 areas: employment, education, family, housing,

medical-psychiatric, legal, sobriety, social-recreational, personal improvement, and transportation. Subjects selected two to four goals based on their assessments and every week selected three activities to be completed the next week in order to meet their long-term goals. Activities were not mandated but all participants were encouraged to work on social-recreational and sobriety goals (Petry et al., 2006).

When activities were completed and verified by receipts, brochures or other documentation, one draw from a prize bowl was awarded for each completed activity. Draws increased by one for every consecutive week that three activities were completed. Five bonus draws were also awarded for every week that three activities were completed for a total of 294 draws across the study's timeframe. If a participant failed to complete a selected activity, their draw was reset to one draw per activity. When all three activities were done, earned draws were reset back to the highest number attained prior to the failed completion. The prize bowl contained 500 cards with 275 showing "Good job, try again" and did not earn a prize. Of the 255 prize cards, 199 were small prizes such as $1 fast food vouchers or a bus token, whereas 25 cards were large prizes such as movie passes, phone cards, etc., and one card was for the largest prize worth $100 in merchandise such as a DVD player or five of the other large prizes (Petry et al., 2006).

In the third condition, subjects received the standard treatment, the 15-minute education component, breath and urine collections, and instead of choosing an activity for the chance to win prizes, participants in this group could

win prizes for every negative specimen for heroin, alcohol and cocaine they submitted. Petry et al. (2006) noted that positive specimens were most often for cocaine use, followed by heroin use and lastly alcohol use. The first submission of negative specimens earned one draw from the prize bowl with the number of draws increasing by one for every consecutive negative specimen. A five-draw bonus was earned each week if all samples were negative. If a participant tested positive for any one of the three substances (cocaine, heroin or alcohol) or refused to submit a specimen or was a no show, the number of draws went back to one. After two consecutive weeks of negative specimens, the number of draws was reset to the number earned prior to the above conditions. A total of 291 draws could be earned for submitting negative specimens for all 21 drops across the 12-week study (Petry et al., 2006).

Findings from the study showed that contingency management led to some improvements, however, the contingency management activity condition was less effective than the contingency management abstinence condition in “retention and some drug abuse outcome measures.” This finding was not in keeping with the results of a study conducted by Iguchi et al. (1977) that showed “contingency management treatment that reinforced activity completion resulted in greater reductions in drug use than a contingency management treatment that reinforced abstinence directly” (Petry et al., 2006, p. 599). Several reasons were cited by the authors for the difference in findings:

- Methadone patients abuse more drugs and therefore have more positive specimens during treatment; however, 99% of subjects in this study achieved at least one negative sample.
- Reinforcer type and magnitude varied between the studies (prizes in this study and vouchers in the Iguchi study).
- Activities were more difficult in this study (e.g., creating a resume) and may have resulted in overall lower rates of reinforcement.
- In this study there were few differences between the two contingency management conditions based on ASI scores, which may reflect the individualized nature of the activity choices.
- A more comprehensive assessment instrument that allowed for more areas of functioning might be more effective.
- Subjects with an alcohol only assessment were excluded from the study; their inclusion may have changed outcomes.
- Urine samples were collected infrequently, which may not represent actual return to drug use.
- Engagement in targeted behaviors may not correspond directly to drug use behavior changes (Petry et al., 2006).

Strengths of the study as noted by the authors included study design which “specifically examined the important issue of target of reinforcement. Overall scheduled magnitudes of reinforcement were equated between the two contingency management conditions, and amount of time and personal attention received by the research assistant were similar in all three conditions. Multiple

outcome measures were assessed, and all showed some degree of concordance. Reasonable sample sizes were included, and adequate rates of follow-up were achieved. The study was conducted in a community-based treatment program, with treatment as usual provided to all patients as the standard of care" (Petry, et al., 2006).

Another study (Schmitz, Lindsay, Stotts, Green & Moeller, 2010) reviewed the effectiveness of Levodopa, a dopamine precursor, versus a placebo, and its effectiveness when combined with contingency management conditions that targeted these behaviors: attendance, medication compliance, and cocaine abstinence. The initial protocol demonstrated the effectiveness of levodopa treatments versus placebo that included abstinence-based contingency management. The second arm of the study was run concurrently in 2008 and examined levodopa treatment effects across different contingency management conditions. One hundred one subjects dependent on cocaine and seeking treatment met inclusion criteria to participate in a 12-week, randomized, placebo-controlled trial of levodopa. Subjects provided medical histories and received a physical examination as well as laboratory tests for liver and thyroid function and a cardiac evaluation. Blood pressure, heart rate and weight were obtained each week. The Structured Clinical Interview and the Addiction Severity Index were administered prior to the study. In the CM (contingency management)-URINE condition, subjects were given vouchers worth cash amounts for urine drops that were negative for cocaine; in the CM-ATTEND condition, vouchers were earned for attending clinics three times each week; in

the CM-MEDICATION condition, vouchers were earned for evidence of pill taking behavior through monitoring by Medication Event Monitoring Systems and tests to determine the presence of riboflavin (Schmitz et al., 2010).

Previous research noted in this study supported the use of contingency management in reinforcing medication compliance such as with retroviral medications in HIV-positive methadone patients. This study examined six different treatment conditions: levodopa/carbidopa (800/200 mg/d) or placebo given in combination with one of three different behaviors noted earlier. In the CM-ATTEND condition, cash-valued vouchers were earned for attending clinic visits three times each week; in the CM-MEDICATION compliance condition, vouchers were earned contingent upon evidence of pill taking obtained by the number of electronic cap openings by Medication Event Monitoring Systems and evidence of riboflavin, administered at 100mg strength in the levodopa capsule. Vouchers were earned based on cocaine-negative urine results in the CM-URINE condition. In addition to medication dosing on an escalating schedule until the final week of the study when dosing was reduced, subjects attended brief meetings conducted by nursing staff three days each week. A missed session could be rescheduled on an off day without penalty. A one-hour session that was led following a manual on cognitive-behavioral therapy was also required. A research assistant followed targeted behaviors and distributed vouchers each week. Voucher values started at $2.50, increasing by $1.25 for each consecutive occurrence of a targeted behavior. A $10 bonus voucher could be earned for evidence of three consecutive occurrences of a targeted behavior. Subjects were

given written documentation of earned vouchers and the coinciding dollar amount. Vouchers could be exchanged for gift certificates or for cash at any time during the trial. Total amount that could be earned was $997.50 over the 12-week period (Schmitz et al., 2010).

At the study's half-way point, 51% of participants were continuing in the study and during the final week of the study, 35% remained with a higher retention level found in the CM-ATTEND condition. The study did not support the hypothesis that levodopa would enhance the effectiveness of contingency management rewards. "The observed lack of Levodopa versus placebo differences on CM effects for attendance and medication compliance outcomes fails to support a general reward enhancement explanation. That Levodopa enhanced responding only under the urine-based intervention suggests a more nuanced synergy between Levodopa and CM" (Schmitz et al., 2010, p. 242).

The authors concluded, "While most CM interventions target abstinence outcomes, this study provides evidence of improved outcomes when targeting therapeutic goals of clinic attendance and medication compliance, consistent with previous reviews of CM effectiveness (Griffith et al., 2000; Lussier et al., 2006)" (Schmitz et al., 2010, p. 242). The study's finding that higher voucher earnings were obtained in the CM condition that reinforced attendance meant that targeting this behavior gave participants more opportunities for contact with contingencies. The authors suggested shaping as a tool that could be used by successively increasing the task's difficulty by beginning with CM reinforcement for clinic attendance, building on this behavior by adding medication compliance

as another targeted behavior and subsequently, the target behavior of abstinence (Schmitz et al., 2010).

Study limitations noted by the authors were small sample size and a high attrition rate and added, "…although significant CM effects were found, actual rates of responding were less than robust, perhaps because of variations in the administration of the CM" (Schmitz et al., 2010, p. 243). Despite its limitations, authors concluded that the strengths of the study, specifically its design, allowed "testing of the independent and interactive effects of the treatment factors," and that contingencies were "well-defined using objective measures of the target behavior" (Schmitz et al., 2010, p. 243). The study's examination of the interaction of levodopa and abstinence-based contingency management could support a new approach for reward-based interventions that may successfully compete with the highly addictive reinforcing effects of cocaine (Schmitz et al., 2010).

Results of a meta-analysis by Prendergast, Podus, Finney, Greenwell and Roll (2006) support the effectiveness of varied contingencies used during treatment for illicit drugs and other substances such as nicotine and alcohol. When contingencies are removed, targeted behaviors diminish slowly with time, yet individuals are able to benefit from treatment with contingencies. The authors caution that while drug users who are early in their use or for those who are not in full blown dependence, reinforcement for abstinence only, with fewer services and limited staff requirements may be effective for this population but the "limited data on effect sizes following CM suggest that continuing care is warranted"

(Prendergast et al., 2006, p. 1556) when using CM only with more dependent drug users. The authors acknowledge a large body of empirical studies exists regarding contingency management used with different drugs of abuse, a “high methodological quality of CM studies,” and the “relatively high mean effect size provide strong support for CM as being among the more effective approaches to promoting abstinence during and after the treatment of drug dependence disorders” (Prendergast et al. 2006, p.1556). Recommended future research, according to the authors, should include “examination of the relative effectiveness of different types of CM, further investigation of moderators of the impact of CM and comparison of the effects of CM and other treatment approaches” (Prendergast et al., 2006, p. 1556).

CHAPTER 5

STAGES OF READINESS AND MOTIVATION FOR CHANGE

In spite of the highly addictive properties of crack cocaine and other substances, change is possible but many times individuals enter treatment with ambivalence about changing their behaviors (Ramsey & Newman, 2000). In order for change to happen, the individual has to be ready to change. Frequently referenced in addiction literature is an empirical transtheoretical protocol consisting of five stages that define readiness for change (Prochaska, DiClemente & Norcross, 1992; Center for Substance Abuse Treatment, 1999; Bloom & Smith, 2001; Floyd & Seale, 2002; Edwards, Marshall & Cook, 2003).

The five stages are not linear in construct but rather circular to account for the recycling that may occur by an individual through the various stages. The stages and the defining elements (Prochaska et al., 1992) are:

1. Precontemplation: No intent to change; little insight about ramifications of substance use; if in treatment probably mandated by judicial system or by a significant other such as a spouse; procrastination common.
2. Contemplation: More aware of problems caused by substance use and may consider actions to change but there is no commitment to a process of change; passively look at pros and cons of use; giving “lip service” to change.

3. Preparation: may take some steps to stop using such as reducing use or avoiding use at certain times; plan in place for change and state intention to start in near term.
4. Action: Steps taken to achieve targeted goals; can show specific actions taken to alter addictive behavior with tangible results; feel hopeful and empowered but vulnerable to relapse at any point in time.
5. Maintenance: engaged in lifestyle changes for more than six months; working on relapse prevention plan and solidifying treatment targeted goals.

Individuals may move in and out of each stage. For example, an individual may move from the action phase into relapse and be precontemplative about changing or moving from relapse into a preparation stage that would allow removal of obstacles that precipitated relapse. By basing interventions on where the individual is in the change cycle, the therapist connects with the individual, avoiding antagonism and improving the likelihood of success (Floyd & Seale, 2002).

In the stages of change model, therapists strategize with the client, do not take on an authoritarian role and avoid confrontation. An atmosphere of cooperation is created with the goal of increasing “the intrinsic motivation,” and “leaving them with the responsibility to effect their own change” (Edwards et al., 2003, p. 316). Early in the process, clients are helped to explore ambivalence

using client-centered counseling, including open-ended questions, reflective listening, affirmation, and summarizing (Edwards et al., 2003).

Goldstein (1994) noted, that Prochaska's model provides " … a practical framework in the treatment setting" (Goldstein, 1994, p. 315). Clients in the precontemplation stage are able to change and those in the action stage may fail. Goldstein stated that the stages of change model is "over-simplified and artificial" and "despite its shortcomings, the 'stages of change' model is routinely used by clinicians in the alcohol and addictions field…" (Goldstein, 1994, p. 315).

Giovazolias and Davis (2005) conducted a study following Prochaska's model regarding matching appropriate therapeutic intervention according to the stage of readiness for change in addictive clients. A distinguishing characteristic of this study is that it focused specifically on the perspectives of individuals with drug and alcohol issues, examining a client's view as to the most appropriate intervention in relation to their stage of readiness. The authors hypothesized that "clients in the early stages would consider non-action interventions to be significantly more helpful, while clients in the later stages would find action-oriented interventions to be more beneficial for them" (Giovazolis & Davis, 2005, p. 175).

Clients in the study had drug and/or alcohol problems and were recruited from an outpatient clinic within the National Health Service. Each participant received an information sheet, consent form, two questionnaires and a stamped addressed return envelope in which they were to return their questionnaire, either drug or alcohol, based on their perceived addiction issue.

The first questionnaire classified clients into one of the five stages of change based on their "…recent drinking or drug use, reported intention to change, and recent quit-change attempts" (Giovazolis & Davis, 2005, p. 176). The second questionnaire, created by Giovazolis and Davis, included demographic characteristics and questions specific to their histories of previous treatment. Eight questions dealt with the type of therapy they thought would be most appropriate at present. Using a five-point Likert scale, clients were asked to indicate their degree of agreement or disagreement and the degree of helpfulness or usefulness of treatment. Four of the eight questions represented an "action-oriented, high structure counseling style, and four represented a non-action, low structure facilitative approach" (Giovazolias & Davis, 2005, p. 176). On receipt, the anonymous questionnaires were numbered in the order they were received and were transferred to an SPSS statistical package for analysis (Giovazolias & Davis, 2005).

Ninety-five completed questionnaires were turned in for a response rate of 53%; 55 were male and 40 were female. The majority of respondents were between 31 and 40 years of age (21.1%), 62.1% reported drugs as their primary addiction problem and of those, 61% were males and 39% were females. Allocation of participants to the five stages of change were as follows: 14.7% in the precontemplative stage; 21.1% in the contemplation stage; 18.9% in the preparation stage, 20% in the action stage and 25.3% in the maintenance stage. Statistical analysis indicated significant differences in preferences, with those in

the early stages “showing a strong inclination to the non-action oriented interventions (p<.001)” (Giovazolias & Davis, 2005, p. 177).

Outcomes of the study cited by the authors as being of interest were the finding that the majority, 64.2%, of respondents were in the later stages of readiness to change, which the author stated was logical since recruitment took place at Drug and Alcohol Services and participants should be in at least the contemplation stage of change because they had made the commitment to attempt treatment. By comparison, 14.6%, a relatively large percentage based on the sample size, were in the precontemplation phase, which was in agreement with findings from similar studies. The study’s finding that more men were in the earlier stages of change, while females were in the later stages, led the authors to speculate that “perhaps men are more reluctant than women to recognize, accept and seek help for their addictive problems” (Giovazolias & Davis, 2005, p. 179). The other interesting outcome the authors noted was that participants in the earlier stages, irrespective of gender, “significantly prefer non-action oriented therapeutic interventions than action-oriented interventions (Giovazolias & Davis, 2005, p. 179).

According to the authors, of even greater interest was their finding that “no difference exists between those who had seen a therapist and those who did not have this experience, in terms of their preferred therapeutic interventions” (Giovazolias & Davis, 2005, p. 180). Rather than expecting a “magical solution” (Giovazolias & Davis, 2005, p. 180), those who had not experienced therapy were realistic about what would actually be of help to them. The study found a

higher correlation between stages and preferred therapeutic intervention for participants with drug addiction, “indicating that this group has a stronger tendency to prefer non-action interventions when they are in the ‘early’ stages, and action-oriented interventions when they are in the later stages of change” (Giovazolias & Davis, 2005, p. 180). The results of the study “indicate that there is a strong match between the theoretical predictions and the clients’ views on this issue. In other words, it seems that clients in the ‘early’ stages of change (i.e. Precontemplation, Contemplation), irrespective of gender or whether they had seen a therapist in the past, consider non-action oriented therapeutic interventions to be more beneficial for them, whereas clients in the ‘later’ stages of change (Preparation, Action, Maintenance) regard action-oriented interventions to be more helpful” (Giovazolias & Davis, 2005, p. 181).

A therapeutic intervention that is useful in motivating clients through the stages of change is the Motivational Interview (MI), developed by William Miller, and referenced frequently in addiction literature (Peele & Brodsky, 1991; Substance Abuse and Mental Health Services, 1999; Miller & Rose, 2009). The technique “draws on strategies from client-centered counseling, cognitive therapy, systems theory and the social psychology of persuasion” (Peele & Brodsky, 1991, p.183). Related to the stages of change, motivational interviewing, set in an atmosphere of nonconfrontation, using “open-ended questions, reflective listening, affirmation and summarizing,” motivational interviewing helps the client to view the discrepancy between their behavior and their targeted goals. Motivational interviewing “develops and amplifies this

discrepancy, ultimately allowing the patient to present the reasons for change without feeling coerced" (Peele & Brodsky, 1991, p. 183).

Interestingly, Miller's technique came from an unexpected finding after Miller trained nine counselors in behavioral self-control training and accurate empathy. Three supervisors observed the trained counselors using these techniques, using a rank ordering as to the extent the counselors used empathetic understanding during therapy. At six, 12 and 24 months post-treatment, counselor empathy accounted for statistically significant outcomes for therapist style and not for the behavioral interventions being compared and later research by others confirmed this finding (Miller & Rose, 2009).

"A guiding principle of MI was to have the client, rather than the counselor, voice the arguments for change" (Miller & Rose, 2009, p. 528). Motivational interviewing was incorporated into different models of treatment by Miller and others. Three clinical trials (Miller and Brown, 1993) randomly assigned participants in each trial into one of two groups: one MI session at the onset of treatment or no MI session at the start of treatment. In all trials, participants who received the MI session at outset of treatment showed "double the rate of total abstinence three to six months after inpatient treatment" (Miller & Rose, 2009, p. 528).

With more than 200 clinical trials published and efficacy reviews and meta-analyses conducted, MI has found positive outcomes in trials conducted on cardiovascular rehabilitation, diabetes management, problem gambling, and others in addition to substance use. Multi-site trials have been conducted using a

form of MI that combines MI with motivational enhancement therapy (MET). MET is defined in a study conducted by Lawendowski (1998): “Motivational Enhancement Therapy (MET) embeds MI within a structured format of standardized intake assessment, personalized feedback of test results, and follow-up interview to facilitate treatment outcome evaluation” (Lawendowski, 1998, p. A39).

The first multi-site trial of MET was Project MATCH, a nine-site trial with 1,726 clients. “Outcomes through three years of follow-up were found to be similar for a four-session MET and two 12-session treatment methods with which it was compared, yielding a cost-effectiveness advantage for MET” (Miller & Rose, 2009, p. 529). However, Miller and Rose (2009) noted that not all trials yielded positive results. Citing other studies, null findings were reported with eating disorders, drug abuse and dependence, smoking, and problem drinking. Clinician delivery of MI is a factor and not all participants respond positively to MI-based therapy, and efficacy of MI may vary across populations, which account for some of the null findings in trials. The authors stated, “Such variability in outcomes across and within studies suggests the need to understand when and how a treatment works and the conditions of delivery that may affect its efficacy” (Miller & Rose, 2009, p.529).

While the authors raised some of concerns with MI such as the relationship between therapist responses, client speech and subsequent behavior change, discovering how therapist empathy actually affects client outcomes and determining relational and technical components of MI, after 30

years of research, “motivational interviewing is a psychotherapeutic model that is evidence-based, relatively brief, specifiable, applicable across a wide variety of problem areas, complementary to other active treatment methods, and learnable by a broad range of helping professionals” (Miller & Rose, 2009, p. 535).

Using MI and/or MET provides an atmosphere that encourages individuals in drug abuse treatment to look at the disconnect between where he or she is in the stage of change continuum and to work toward targeted behavioral goals that are achievable. The cookie cutter or one size fits all mentality that has been used so often in treatment modalities is no longer refutable as a valid methodology for successful treatment outcomes. A study conducted by Rohsenow, Monti, Martin, Colby, Myers, Gulliver, Brown, Mueller, Gordon and Abrams (2004) provided additional evidence of the effectiveness of MET. The study recruited 165 cocaine-dependent clients enrolled in daily substance abuse treatment in a hospital setting that focused on learning theory and the 12-Step philosophy. The study provided two sessions for cocaine-specific MET or a control condition of meditation relaxation treatment (MRT) only during the first three days of a treatment substance abuse treatment program. Patients met cocaine dependence criteria according to the Structured Clinical Interview for DSM-IV, patient version (1995) and to have used cocaine at least 10 days during the six months before admission. Actively psychotic individuals and those who planned to stay less than five weekdays were excluded from the study. Informed consent forms were completed on the second day of the study and assessments were done following recruitment, at discharge and again at three, six and 12 months

post-discharge. Treatments consisted of 50-minute sessions every day, “with individual sessions for two days followed by group sessions on subsequent days. The study treatments replaced the program’s groups on functional analysis and relapse prevention. Patients attended all other program activities (Rohsenow et al., 2004, p. 864).

Using a Timeline Followback interview, which was given for six months before treatment began and at each follow-up, assessed number of days of cocaine, alcohol and other drug use and at every follow-up, urine specimens were collected to determine drug use and a close friend or family member was interviewed to corroborate the patient’s drug use or abstinence during this period. “The Addiction Severity Index, 5th edition (ASI), which was given at pre-treatment and at every follow-up was scored for the composite indices. For MET feedback, some questions were repeated adding ‘as a result of your cocaine use’ (Rohsenow et al., 2004, p. 864).

For MET feedback, additional measures were completed by all patients before randomization into the two study groups: Cocaine Effects Questionnaire for Patient Populations, Cocaine Negative Consequences Checklist, Arithmetic subtest of the Wechsler Adult Intelligence Scale-Revised, Logical Memory Test of the Wechsler Memory Scale and Symbol Digit Modalities Test in addition to a checklist of 10 medical consequences of cocaine, 12 route-specific consequences, five pregnancy/fetal effects and four accident risk items were administered. AIDS risk comprised 33 items regarding frequency of cocaine-

related risky sexual behavior and risky drug use practices during the previous 30 days from the Risk Behavior Assessment (Rohsenow et al., 2004).

For MET, the initial session dealt with the patient's understanding of the pros and cons of their cocaine use, quitting cocaine, life goals and how cocaine impacts achieving those goals, and their life one and 10 years from that point with and without cocaine use. The second session reviewed their assessment feedback as follows: "cocaine use relative to norms for cocaine abusers in treatment and legal outcome, consequences identified by cocaine-modified ASI questions and Cocaine Effects Questionnaire, neuropsychological functioning (presented as five-point scales from well below average to well above average), accident risk due to cocaine, medical complications from intoxication, withdrawal, route, pregnancy and ASI items, and AIDS risk resulting from cocaine use. The session closed with a summary, elicited reactions, built hope for improvement through cessation, provided help with decision making and reinforced self-efficacy" (Rohsenow et al., 2004, p. 865-866).

MRT was selected because relaxation training is commonly used in substance abuse treatment even though there is no scientific evidence to prove it is effective with changing substance use. During the first minutes of each session, patients were taught to focus on sensations such as warmth and heaviness in each body part. Without interrupting the physical relaxation sensation, patients were told to visualize a pleasing scene that did not include drug use (Rohsenow et al., 2004).

Following statistical analysis of the groups, it was found that “MET had several beneficial treatment effects when provided at the start of an intensive substance abuse treatment program for cocaine dependent patients, particularly for those low in initial motivation to change cocaine use. Although low pre-treatment motivation in the contrast condition predicted higher relapse to cocaine in the first 3 months, patients in MET with low initial motivation reported lower rates of relapse to alcohol at 4-6 months, less relapse to cocaine and alcohol at 1 year follow-up, fewer cocaine and alcohol use days during the year and less sever alcohol problems than patients in MET with higher initial motivation to change. Thus, MET appears to be more beneficial for less motivated patients than for more motivated patients. Also, there was a significant time x treatment interaction for employment problems; patients in MET tended to report a decreasing severity of employment problems over the year of follow-up while contrast patients did not” (Rohsenow et al, 2004, p. 872).

Statistical analyses were conducted to assess effects of individual treatment with MET versus MRT and across other variables such as scoring on the various instruments administered across the study. “An ANOVA showed higher effectiveness rating for MET (M=6.2 ± 1.1) than MRT (M=5.8 ± 1.2), $F_{1.139}$=3.85, P<0.005, *f*=0.17 (small)” (Rohsenow et al., 2004, p. 871).

Despite study limitations, which included sample size, attrition, using a private substance abuse program rather than a community based program and using an intensive program versus less intensive outpatient programs, the authors concluded that “programs that provide MET should probably provide it

only to patients who are less motivated to change" and that "promise was shown for the value of two sessions of MET early in treatment for cocaine abusers . . ." (Rohsenow et al., 2004, p. 872).

CHAPTER 6

FINDING ALTERNATE BEHAVIORS

Finding alternate behaviors when abstinence from one or more drugs is achieved is paramount to prevent relapse. Moos (2006) noted, “Behavioral economics or behavioral choice theory, which is closely related to the social control perspective, focuses specifically on involvement in protective activities. In behavioral choice theory the key element of the social context is the alternative reinforcements provided by activities other than substance abuse. These alternative reinforcements can protect individuals from exposure to substances and opportunities to use them, as well as from escalating and maintaining substance use. The theory posits that the choice of one reinforcing before, such as substance use, depends in part on lack of effective access to alternative reinforcements, such as involvement in school and work pursuits, religious engagement, and participation in physical activity. For example, physical activity and substance use may both elevate mood and decrease anxiety, which make them functionally similar and substitutable” (Moos, 2006, p. 183).

Two behaviors frequently recommended to take the place of drug using behavior are exercise and relaxation training (Urschell, 2009; Prentiss, 2007; Peele & Brodsky, 1991; Bilodeau, 1992; Ratey, 2008). While both behaviors have been proven as viable alternatives to drug using behaviors, this review will focus on behavioral relaxation. Poppen (1988), following up on Edmund Jacobsen’s original progressive relaxation model, posited a Behavioral

Relaxation Scale (BRS) in order to measure relaxation to determine treatment outcomes.

The BRS consists of ten postures and their coordinating observable "relaxed" and "unrelaxed" states. The areas targeted for relaxation are: head, eyes, mouth, throat, shoulders, body, hands, feet, quiet, and breathing. Poppen noted, "The BRS has been shown to change in the expected direction when people undergo relaxation training in the motoric domain, namely progressive relaxation training (BRT), frontalis EMG biofeedback, and, of course BRT" (Poppen, 1988, p. 45).

Depressive disorder is a common diagnosis with drug use. Whether it is present prior to drug abuse or is a by-product of withdrawal from drug use, depression and substance use often occur concurrently. Carpenter, Smith, Ahdronovich and Nunes (2008) noted, "The relationship between environmental contingencies and the course of depression and substance abuse suggests that targeting environmental factors may be a particularly useful strategy for simultaneously treating both disorders" (Carpenter, et al. 2008, p. 643). A randomized trial of Behavioral Therapy for Depression in Drug Dependence (BTDD) was compared to an attention control with Relaxation Therapy (REL) selected as the control condition (Carpenter et al., 2008).

Of the 126 methadone-maintained opiate dependent candidates assessed for inclusion in the study, 38 were accepted based on study inclusion criteria, which included administration of the Structured Clinical Interview for DSM-IV Substance Abuse Comorbidity, "current DSM-IV Major Depression or Dysthymic

Disorder and a stable methadone dose (no changes in the prior two weeks) of 60 mg or greater; lower methadone doses were allowed if part of a slow methadone taper following a successful maintenance period" (Carpenter et al., 2008, p. 643), and completion of consent forms.

Depression severity was assessed at baseline and at the start of each weekly session by one of the study's trained and experienced clinicians using the 29-item Hamilton Depression Scale. Participants rated their depression using the 21-item Beck Depression Inventory II at baseline and bi-weekly during treatment.

At the beginning of each session, a clinician administered the Substance Use Weekly Inventory to ascertain the number of days that opiates, cocaine, alcohol, cannabis, sedative-hypnotics, stimulants and other substances were used since the participant's last session. Urine samples were collected weekly under observation by a study staff member and were tested for opiates, cocaine and benzodiazepines. Of the 533 urine samples collected, 370 had corresponding self-reports for use the prior week; of those 370, "agreement between toxicology results and self-reported use was 89% for opiates, 95% for cocaine, and 94% for benzodiazepines" (Carpenter et al., 2008).

Participants were randomized to either one of two treatment conditions: BTDD or REL stratified by antidepressant use at the time of study entry and illicit drug use during the week prior to the start of the study. The BTDD section used three operant-based treatments: changing reinforcement events, community reinforcement approach and treatment plan contingency management program.

BTDD was administered over 24-weekly sessions and clinicians used a structured treatment guide. Activities focused on improving the number and quality of interactions participants experienced with their environments. At weekly sessions, participants “defined objectively verifiable out-of-session activities to increase the amount of pleasant activities in specified life areas” (Carpenter et al., 2008, p. 645).

A Treatment Plan Contingency Management system was implemented that gave points for actively participating in sessions (three points) and completing out-of-session homework (10 points). Verification of out-of-session homework was required by submitting movie ticket stubs, etc., and activities were agreed to during the previous week’s session.

A total of 208 points were possible for 100% attendance (72 points) and completion of all out-of-session homework (136 points). Voucher points equated one dollar for each point and could be exchanged for goods and services selected by the participant and in sync with treatment goals (Carpenter et al., 2008).

REL was given across the 24-weekly sessions using a training manual. REL incorporated four areas constituting successful therapies for depression: “a clear rationale for treatment, provision of skills to help individuals become more effective in handling his/her life, an emphasis on the use of these skills outside of the therapy context, and reinforcing therapy success to use these skills” (Carpenter et al., 2008, p. 645).

The three relaxation methods covered were: progressive muscle relaxation, autogenic relaxation exercises and visual imagery based on idiographic scenarios of relaxation or tranquility. Participants used the techniques during weekly sessions and were encouraged to track depression/anxiety during the week and use relaxation exercises. All participants were told they could begin taking medication if depression significantly worsened or they felt they had not improved after six weeks of treatment.

Clinicians completed a BTDD or Relaxation Therapy Checklist, which contained key areas of each treatment and how to access adherence to each therapy condition, following every session (Carpenter et al., 2008).

The average depression ratings at the study's end indicated a significant decrease in self-reported and clinician rated depression during treatment; however, the rate of change did not differ between treatment conditions. Participants in BTDD earned approximately one-third of the maximum number of voucher points that could be received. Among participants who received BTDD, there was a significant increase in the probability of opiate use during treatment after adjusting for adjunctive pharmacotherapy.

The significant reduction in depressive systems observed in both the BTDD and REL conditions "supports the possible utility of both treatment strategies in this population and suggests possible avenues for the continued refinement of a behaviorally based treatment program for depression and comorbid substance use in a methadone-maintained population" (Carpenter et al., 2008., p. 649). The authors noted, "Relaxation training may offer an important

therapeutic technique for treating depression among dually-diagnosed patients. The acceptability of the treatment suggests that incorporating these techniques in a comprehensive program may promote better attendance and engagement compared to more demanding behavioral interventions" (Carpenter et al., 2008., p. 649).

Contingency management, however, may have been affected by the presence of a depressive disorder and the authors concluded that vouchers "of a larger magnitude that target both abstinence and treatment plan activities may increase the effectiveness of this strategy for treating both depression and comorbid substance use" (Carpenter et al., 2008, p. 650) and "focusing on avoidance behaviors and placing change in the broader context of valued life goals may provide a better strategy than focusing solely on increasing pleasant activities" (Carpenter et al., 2008, p. 650).

The authors recognized several study limitations: small sample size and significant attrition rate limited the power to detect group differences and restricted generalizability to other populations; no control condition eliminated equating the benefits of the study's treatment conditions to the no treatment condition; the BTDD condition had a higher proportion of opiate users, which may have reduced the efficacy of BTDD relative to REL and could explain the increase of opiate use over the course of the trial for BTDD participants (Carpenter et al., 2008).

CHAPTER 7

IS A “CURE” POSSIBLE?

Based on the research literature reviewed regarding drug addiction, there is no “cure” per se, no magic bullet, no easy out. Drug addiction is a life-long condition that may be managed through a willful dedication to change the behaviors that resulted in dependence on crack cocaine or other substances. Ongoing research, as presented here, is promising because it is evidence-based, which makes it plausible as a viable avenue for change. Brain research, particularly that which examines the chemical circuitry involved in naturally occurring rewards and how drugs short-circuit and shutdown pathways, alters cell content and consequently the ability to decide against drug taking behaviors, is encouraging.

What if a vaccine were available, similar to measles or tetanus vaccinations, that could eliminate the negative repercussions associated with drug dependence? Anti-drug vaccines could train the immune system to destroy a drug like cocaine before it reached the brain. But the brain does not operate alone. “To accept the proposition of an addict’s powerlessness is to eliminate volition from the equation, for we know from hard evidence that addicts can and do kick the habit. And, no matter how difficult it eventually becomes to exercise choice, there is always a period at the outset when choice is not only possible but relatively easy,” according to Rosenthal (Rosenthal, 2008, p.43).

In spite of its detractors, immunology studies are ongoing. To be effective, anti-drug vaccines used to thwart the major drugs of abuse – nicotine, heroin, cocaine and methamphetamine, need to produce “a high concentration of antibodies with high affinity for the drug, would bind the drug molecule in the circulation and prevent it from crossing the blood-brain barrier and accessing its receptor in the brain” (Kinsey, Jackson & Orson, 2009, p. 309).

Thus far, anti-drug vaccines have shown promise when used in rodents, “both in terms of the concentration of antibodies elicited by the vaccine and in the reduction of drug associated behavior shown by vaccinated animals when challenged with the drug” (Kinsey et al., 2009, p. 309).

A vaccine that would prevent cocaine from reaching the brain would be beneficial in conjunction with behavior analysis and therapy. According to Kinsey et al. (2009), the vaccine should have “few side effects, and should elicit high levels of antibodies of good affinity after a reasonable delivery schedule” (Kinsey et al., 2009, p. 311). The authors noted, “The approximate concentration of cocaine in the blood after a session of smoking crack, for example, is well known, and the concentration of anti-cocaine antibodies in vaccinated individuals is also known. Comparing those numbers makes it evident that a person determined to get a high from cocaine could easily just take more. That is why it is so essential that anti-cocaine vaccination be accompanied by other forms of intervention, such as drug counseling, to achieve a successful outcome for the addict” (Kinsey et al., 2009, p. 311).

Peterson and Owens (2009) reviewed research on the development of an anti-drug vaccine for methamphetamine addiction. Like the Kinsey, et al, research referenced above, the authors concurred that a vaccine alone is not the answer. “Results from preclinical and clinical studies of active and passive vaccines against drugs of abuse show promise as a viable medical approach to treat addiction. However, antibody antagonists are not intended to be used as a standalone ‘magic bullet’ to cure drug abuse. Similar to insulin treatment for diabetic patients, they are likely best used in combination with a long-term comprehensive medical approach. Thus, the next critical steps are to optimize the therapeutic potential and timing of active or passive immunizations and to couple these with a behavioral modification program aimed at helping patients relearn constructive behaviors, impulse control, and resistance to the craving for the drug” (Peterson & Owens, 1999, p. 122).

CHAPTER 8

AT WHAT COST?

> *I loved the feeling of doing coke and heroin in a restaurant bathroom because it was so sneaky. I had to walk into the restaurant without anyone noticing, do my drugs, and walk out again without getting caught. I loved the risk, the hidden identity that I held, and the secret I was hiding. It made me feel a little like James Bond.*
>
> (Prentiss, 2007, p. 108).

A study conducted by the RAND Corporation in 2005 estimated the cost to the public for stimulant abuse to be $23 billion (Peterson & Owens, 2009). The U.S. Department of Justice, National Drug Intelligence Center, National Drug Threat Assessment 2010 (February 2010), reported, “The trafficking and abuse of drugs in the United States affect nearly every aspect of our lives. The economic cost alone is immense, estimated at nearly $215 billion. The damage caused by drug abuse and addiction is reflected in an overburdened justice system, a strained healthcare system, lost productivity, and environmental destruction” (National Drug Threat Assessment, 2010).

Statistics supporting the payout of drugs from the National Drug Threat Assessment referenced above follow:

- In 2008, approximately 2.9 million individuals tried an illicit drug or used a prescription drug nonmedically for the first time, representing 8,000 initiates per day.
- In 2008, approximately 7 million individuals aged 12 and older were dependent on or had abused illicit drugs in the past year, compared with 6.9 million in 2007. The drugs with the highest dependence or abuse levels were marijuana, prescription pain relievers, and cocaine.
- In 2006, the Drug Abuse Warning Network (DAWN) reported that of 113 million hospital ED visits, 1,742, 887 were related to drug misuse or drug abuse. When drug misuse or abuse is reported in ED visits, the most commonly reported substances are cocaine, marijuana, heroin, and stimulants.
- Due to drug abuse/dependence, in 2007, there were approximately 1.8 million admissions to state-licensed treatment facilities for illicit drug use/dependence, meaning they were not gainfully employed. In addition, in 2008 19.6% of unemployed adults were defined as current users of illicit drugs; 8% of individuals employed full time and 10.2% of individuals employed part-time were current users of illicit drugs. People who are employed but have chronic absenteeism from illicit drug use/abuse also have substantial lost productivity.

- In 2009, in California alone, the California Department of Toxic Substance Control responded to and cleaned up 232 laboratories and dumpsites at a cost of $776,889 or roughly $3,349 per site.

According to the Office of National Drug Control Policy, Drug Policy Information Clearing House regarding Illinois statistics:

- In 2002, there were 977 Illinois drug arrests by the Drug Enforcement Administration (DEA).
- As of June 2005, approximately 25% of adult inmates in Illinois were detained or incarcerated for drug offenses.
- In 2006, there were 996 drug arrests by the DEA and 112,368 state and local (Chicago area) drug arrests.
- In 2006, it was reported that drug trafficking organizations based in Mexico routinely transported metric ton quantities of cocaine into Illinois, mainly Chicago.
- During 2006, 41% of Federally-sentenced defendants in Illinois had committed a drug offense, of which one-third involved powder cocaine.
- During 2006, there were 67,392 drug/alcohol treatment admissions in Illinois.
- As of April 2007, there were 20 drug courts in Illinois with eight more planned for the near-term. As of 2009, there were 2,038 active drug court programs throughout the U.S. and 226 were in the planning stages.

Currently, the focus of the nation is not on the impact of drug dependence on the economy, on our judicial and penal systems, on our healthcare system, on treatment modalities that are more frequently unsuccessful than successful, on the devastation to families who love someone addicted to drugs, etc.

An interesting, but unscientific, experiment is to ask co-workers, friends, and acquaintances if they know anyone who is struggling with an addiction, not including nicotine or caffeine. You may be surprised to find that the majority of the people you query answer “yes.” Chances are they will relate experiences of frustration, helplessness, and despair in trying to find a resolution to their friend or loved one’s addiction.

It is true that there is no “magic bullet” to erase addiction from our human condition. There has to be a concerted effort to change the tide of drugs coming into the country and to address how illicit drugs work in our economy, from providing a livelihood to pawnshop owners to corruption in law enforcement.

It will not be easy. It will take families of addicts who have lost their battle with drugs to stand up and demand change. And to be strong enough to “tell it like it is” to everyone who will listen. To stop being embarrassed or ashamed to talk about the addiction of a son or daughter, husband or wife, mother or father. It will take a grassroots movement similar to Mothers Against Drunk Drivers to raise awareness about the waste of even one life to drugs.

There is significant evidence-based research, some of which has been discussed in this paper, supporting substance abuse treatments that actually may change the path of someone addicted to a substance. Addiction treatment

professionals must start, if they do not already, to become familiar with this body of research and additional studies and incorporate methodologies into their practices. Treatment facilities have to be made accountable for the programs provided and should be mandated to produce outcome statistics that are reviewed by their board of directors and contributors and are part of staff performance evaluations. Perhaps one way to instigate change would be to include the costs associated with drug abuse and dependence in the country to every tax payer in the U.S.

The question is who is going to start the revolution for change?

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